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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/806,875	03/23/2004	Thilaka S. Sumanawccera	2003PI8697US	3873

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Siemens Corporation
Intellectual Property Department
170 Wood Avenue South
Iselin, NJ 08830

EXAMINER

WEATHERBY, ELLSWORTH

ART UNIT	PAPER NUMBER
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3768

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/29/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.		Applicant(s)	
	10/806,875		SUMANAWEERA ET AL.	
	Examiner		Art Unit	
	Ellsworth Weatherby		3768	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>3/23/2004</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. Claim 4 is objected to because of the following informalities: Applicant states in claim 4, "The method of claim 4 wherein..." Applicant should replace the underlined parent claim reference with the appropriate claim number. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 3, 4, 12, and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Jackson et al. (U.S. Patent No. 6,193,660).

Regarding claims 1, 3, and 4, Jackson et al '660 teaches a method for detecting periodic cycle information with ultrasound, the method comprising: obtaining ultrasound data over a period of time (col. 1, lines 6-10); and determining at least a first portion of a breathing cycle as a function of the ultrasound data (col. 7, lines 58-67; col. 8, lines 1-9). Jackson et al. '660 also teaches determining a motion parameter of a current frame of data relative to a reference frame of data (col. 6, lines 53-62). Jackson et al. '660 also teaches determining the motion parameter as a function of a plurality of local regions in the current frame of data relative to the reference frame of data (col. 7, lines 4-7).

Regarding claims 12 and 13, Jackson et al. '660 teaches a system for detecting breathing cycle information with ultrasound, the system comprising: a memory operable to store frames of ultrasound data acquired over a period of time (col. 10, lines 50-53); and a processor operable to determine at least a first portion of a breathing cycle as a function of the ultrasound data (col. 6, lines 38-40; col. 7, lines 58-67; col. 8, lines 1-9). Jackson et al. '660 further teaches that the processor is operable to determine a motion parameter of a plurality of frames of ultrasound data relative to a reference frame of data (col. 1; lines 51-54; col. 6, lines 53-62).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 2, 6, 7, 14, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson et al. '660 in view of Von Behren et al. (PGPub No. 2005/0107704).

Regarding claims 2, 6, and 7, Jackson et al '660 teaches all the limitations of the claimed invention except for expressly teaching that the ultrasound data is responsive to

contrast agents. Jackson et al. '660 also does not expressly teach that the method further comprises displaying a breathing cycle waveform comprising the first portion. Jackson et al. '660 also does not expressly teach identifying the first portion as a function of a trend in the breathing cycle.

In the same field of endeavor, Von Behren et al. '704 teaches a method for detecting periodic cycle information with ultrasound where the ultrasound data is responsive to contrast agents (0022). Von Behren et al. '704 also teaches displaying a physiological cycle waveform comprising the first portion (0019; 0034). Von Behren et al. '704 also teaches identifying the first portion as a function of a trend in the heart cycle (0025; 0026). Here the examiner has interpreted the limitations of the claim where the method identifies a first portion as a function of a trend in the breathing cycle to be met. Identifying a trend in heart cycle through analysis of ultrasound data is done by identifying cyclically varying image intensities, $I(t)$ (0025). This method would be equally applicable to identify cyclically varying image intensities in a breathing cycle.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Jackson et al. '660 with the motion analysis as taught by Von Behren et al. '704. The motivation to modify Jackson et al '660 would have been to use sinusoidal wave characteristics to determine breathing cycle phase and amplitude information, as taught by Von Behren et al.'704 (0019).

Regarding claims 14 and 15, Jackson et al '660 teaches all the limitations of the claimed invention except for expressly teaching that the system further comprises a

display operable to display a breathing cycle waveform. Jackson et al. '660 also does not expressly teach that the processor is operable to identify the first portion as a function of a trend in the breathing cycle.

In the same field of endeavor, Von Behren et al. '704 teaches a display operable to display a physiological cycle waveform (0019; 0020). Von Behren et al. '704 also teaches that the processor is operable to identify the first portion as a function of a trend in the breathing cycle (0025; 0026). Here the examiner has interpreted the limitations of the claim where the method identifies a first portion as a function of a trend in the breathing cycle to be met. Identifying a trend in heart cycle through analysis of ultrasound data is done by identifying cyclically varying image intensities, $I(t)$ (0025). This method would be equally applicable to identify cyclically varying image intensities in a breathing cycle.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Jackson et al. '660 with the motion analysis as taught by Von Behren et al. '704. The motivation to modify Jackson et al. '660 would have been to use sinusoidal wave characteristics to determine and predict breathing cycle phase and amplitude information, as taught by Von Behren et al. '704 (0019).

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson et al. '660 in view of Jackson et al. (PGPub No. 2005/0096543).

The disclosure Jackson et al. '660 teaches all the limitations of the claimed invention except for expressly teaching that the method comprises determining a cost

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function value as a function of time, the cost function value associated with motion between a plurality of frames of data.

In the same field of endeavor, Jackson et al. '543 teaches determining a cost function value as a function of time, the cost function value associated with motion between a plurality of frames of data (abstract; 0006).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Jackson et al. '660 with the cost function determination to find the position of a region of interest in a second frame as taught by Jackson et al. '543. The motivation to modify Jackson et al. '660 in view of Jackson et al. '543 would have been to determine sufficiently matched data between frames, as taught by Jackson et al. '543 (abstract):

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson et al. '660 in view of Von Behren '704 as applied to claim 7 above, and further in view of Sui et al. (PGPub No. 2005/0203395).

Jackson et al. '660 in view of Von Behren '704 teaches all the limitations of the claimed invention except for expressly teaching that the method comprises identifying one of a peak and minimum of the breathing cycle.

In the same field of endeavor Sui et al. '395 teaches identifying one of a peak and minimum of a periodic cycle (claim 21).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Jackson et al. '660 in view of Von Behren '704 with the identification

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of one of a peak and a minimum of the periodic cycle as taught by Sui et al. '395. The motivation to modify Jackson et al. '660 in view of Von Behren '704 with Sui et al. '395 would have been to establish reliable frames of reference that correspond to end points in the periodic cycle.

8. Claims 9,10,16, 17, 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson et al '660 in view of Jackson (U.S. Patent No. 6,673,017).

Regarding claim 9, Jackson et al. '660 teaches all the limitations of the claimed invention except for expressly teaching that the method comprises determining the first portion as a function of a first reference frame of ultrasound data and a first subsequent frame of ultrasound data; identifying reoccurrence of the first portion of the breathing cycle; and repeating the step of determining the first portion as a function of a first reference frame of ultrasound data and a first subsequent frame of ultrasound data with a second reference frame of ultrasound data associated with the reoccurrence of the first portion.

In the same field of endeavor, Jackson '017 teaches a method that comprises determining the first portion as a function of a first reference frame of ultrasound data and a first subsequent frame of ultrasound data (col. 6, lines 10-13); identifying reoccurrence of the first portion of the breathing cycle (col. 5, lines 53-67); and repeating the step of determining the first portion as a function of a first reference frame of ultrasound data and a first subsequent frame of ultrasound data with a second

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reference frame of ultrasound data associated with the reoccurrence of the first portion (col. 6, lines 10-13).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Jackson et al. '660 with the method for identifying of a portion of a physiological cycle and subsequent reoccurrences of the portion relative to multiple frames of reference as taught by Jackson '017. The motivation to modify Jackson et al. '660 in view of Jackson '017 would have been to allow the device to use the most current data when predicting physiological cycle movements.

Regarding claim 10, Jackson et al '660 teaches all the limitations of the claimed invention including tracking motion for each breathing cycle as a function of the reference frame (col. 1, lines 6-10). Jackson et al. '660 also teaches repetitively determining at least a portion of a periodic cycle as a function of the ultrasound data with a different reference frame for each cycle (col. 6, lines 53-62). Jackson et al. '660 does not expressly teach the step of determining at least a first portion of a breathing cycle as a function of the ultrasound data comprises tracking motion for each breathing cycle as a function of the reference frame for each breathing cycle.

In the same field of endeavor, Jackson '017 teaches a method that includes repetitively determining at least a first portion of a physiological cycle as a function of the ultrasound data with a different reference frame for each breathing cycle (col. 6, lines 10-13). Jackson '017 further teaches a step of determining at least a first portion of a breathing cycle as a function of the ultrasound data that comprises tracking motion for

each breathing cycle as a function of the reference frame for each breathing cycle (col. 5, lines 47-49; col. 6, lines 10-13).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Jackson et al. '660 with the method that includes repetitively determining at least a first portion of a breathing cycle as a function of the ultrasound data with a different reference frame for each breathing cycle; and wherein the step of determining at least a first portion of a breathing cycle as a function of the ultrasound data comprises tracking motion for each breathing cycle as a function of the reference frame for each breathing cycle as taught by Jackson '017. The motivation to modify Jackson et al. '660 with Jackson '017 would have been to provide a system that would continuously update a reference frame to account for various transducer movements, as well as, allow the system to predict physiological cycle movements based on the current physiological cycle.

Regarding claim 16, 17, 20 and 21, Jackson et al. '660 teaches a method for detecting a cycle with ultrasound data, the method comprising: tracking motion of a plurality of frames of ultrasound data with respect to a reference frame of ultrasound data (col. 6, lines 57-66); calculating a cyclic parameter as a function of the tracked motion (col. 6, lines 57-65); identifying a portion of the cycle as a function of the cyclic parameter (col. 6, lines 57-62; col. 8, lines 7-9). Jackson et al. '660 also teaches resetting the reference frame of data for each of the plurality of subsequent cycles (col. 6, lines 53-56). Jackson et al. '660 also teaches tracking the motion as a function of a

plurality of local regions (col. 7, lines 4-6). Jackson also teaches tracking motion in B-mode frames of data (col. 2, lines 64-66).

Jackson et al. '660 does not expressly teach repeating for each of a plurality of subsequent cycles the steps of tracking motion of a plurality of frames of ultrasound data with respect to a reference frame of ultrasound data; calculating a cyclic parameter as a function of the tracked motion; identifying a first portion of the cycle as a function of the cyclic parameter for each of a plurality of subsequent cycles. Jackson et al. '660 also does not expressly teach resetting the reference frame of data for each of the plurality of subsequent cycles as a first frame of ultrasound data corresponding to the first portion of the cycle.

In the same field of endeavor, Jackson '017 teaches repeating the steps of tracking the motion of a plurality of frames of ultrasound data with respect to a reference frame of ultrasound data (col. 5, lines 47-50); calculating a cyclic parameter as a function of the tracked motion (col. 6, lines 43-49); for a plurality of subsequent cycles (col. 6, lines 43-47). Jackson '017 also teaches resetting the reference frame of data for each of the plurality of subsequent cycles as a first frame of ultrasound data corresponding to the first portion of the cycle (col. 6, lines 10-13). Jackson '017 also teaches identifying the first portion in a breathing cycle (col. 6, lines 10-13).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Jackson et al. '660 with the method that includes resetting the reference frame of data for each of a plurality of subsequent cycles of Jackson '017. The motivation to modify Jackson et al. '660 with Jackson '017 would have been to

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provide a system that would update reference frame data to provide motion comparisons that are based on the most recent physiological cycle.

9. Claims 11 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson et al. '660 in view of Jackson '017 as applied to claims 10 and 16 above, and further in view of Jago et al. (U.S. Patent No. 6,117,081).

Regarding claim 11, Jackson et al. '660 in view of Jackson '017 teaches all the limitations of the claimed invention except for expressly teaching that the system comprises morphing frames of ultrasound data within each breathing cycle as a function of the reference frame for each breathing cycle.

In the same field of endeavor, Jago et al. '081 teaches a system that comprises morphing frames of ultrasound data within each breathing cycle as a function of the reference frame for each breathing cycle (col. 5, lines 12-33).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Jackson et al. '660 in view of Jackson '017 with the frame morphing to a reference frame for the corresponding physiological cycle as taught by Jago et al. '081. The motivation to modify Jackson et al. '660 in view of Jackson '017 with Jago '081 would have been to allow congruent features to be registered between temporally different frames, as taught by Jago et al. '081 (col. 5, lines 12-33).

Regarding claim 19, Jackson et al. '660 in view of Jackson '017 teaches all the limitations of the claimed invention, including resetting the reference frame for each

corresponding cycle (Jackson '017: col. 6, lines 10-13). Jackson et al. '660 in view of Jackson '017 does not expressly teach that the system further comprises morphing frames of data for each cycle relative to the reset reference frame of data.

In the same field of endeavor, Jago et al. '081 teaches a system that comprises morphing frames of data for each cycle relative to a reference frame (col. 5, lines 12-33).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Jackson et al. '660 in view of Jackson '017 with the frame morphing to a reference frame for the corresponding physiological cycle as taught by Jago et al. '081. The motivation to modify Jackson et al. '660 in view of Jackson '017 with Jago et al. '081 would have been to provide a clearer image that would avoid the smearing effects due to errors in motion estimation, as taught by Jago et al. '081 (col. 5, lines 12-33).

10. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jackson et al. '660 in view of Jackson '017 as applied to claim 16 above, and further in view of Jackson et al. '543.

Jackson et al. '660 in view of Jackson '017 teaches all the limitations of the claimed invention except for expressly teaching that the system comprises calculating a cost as a function of an amount of motion of each of the plurality of frames of ultrasound data relative to the reference frame of data.

In the same field of endeavor, Jackson et al. '543 teaches a system comprises calculating a cost as a function of an amount of motion of each of the plurality of frames of ultrasound data relative to the reference frame of data (abstract; 0006).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Jackson et al. '660 in view of Jackson '017 with the cost function determination to find the position of a region of interest in a second frame as taught by Jackson et al. '543. The motivation to modify Jackson et al. '660 in view of Jackson '017 with Jackson et al. '543 would have been to determine sufficiently matched data between frames, as taught by Jackson et al. '543 (abstract).

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ellsworth Weatherby whose telephone number is (571) 272-2248. The examiner can normally be reached on M-F 8:30 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eleni Mantis-Mercader can be reached on (571) 272-4740. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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EW


ELENI MANTIS MERCADER
SUPERVISORY PATENT EXAMINER

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